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Report to the Ranking Minority Member,
Committee on Governmental Affairs,
U.S. Senate

August 1993

ARMY ACQUISITION

Medium Truck Program Is Not Practical and Needs Reassessment



93-22602



United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

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August 5, 1993

The Honorable William V. Roth, Jr.
Ranking Minority Member
Committee on Governmental Affairs
United States Senate

Dear Senator Roth:

In response to your request, we have reviewed the Army's Family of Medium Tactical Vehicles program. This report includes recommendations to the Secretary of the Army aimed at improving the program's acquisition strategy and cost effectiveness.

Unless you announce the contents of this report earlier, we plan no further distribution of it for 30 days from its issue date. At that time, we will send copies to the Chairmen and Ranking Minority Members of the Senate and House Committees on Armed Services and on Appropriations, the Director of the Office of Management and Budget, and the Secretaries of Defense and the Army. We will also provide copies to others upon request.

Please contact me at (202) 512-4841 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix II.

Sincerely yours,

Louis J. Rodrigues
Director, Systems Development
and Production Issues

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Executive Summary

Purpose

The Army has begun its largest peacetime procurement of medium tactical trucks—the 2.5-ton and 5-ton payload classes—to replace most of its current fleet. A significant portion of the fleet, particularly the 2.5-ton trucks, is rapidly aging, costly to operate, and lacks important operational capabilities. The truck replacement program is known as the Family of Medium Tactical Vehicles.

The Ranking Minority Member of the Senate Committee on Governmental Affairs requested that GAO review the Family of Medium Tactical Vehicles program. GAO's objectives were to determine (1) the feasibility of meeting program and fleet management goals under the Army's 30-year acquisition strategy, (2) the extent to which the Army considered other medium truck alternatives in deciding to move forward with the truck replacement program, and (3) whether more cost-effective alternatives exist now.

Background

In 1984, the Army began planning for a medium tactical truck replacement program that would (1) reduce operation and support costs; (2) improve reliability, availability, and maintainability; (3) improve mobility and deployability; (4) have a high degree of parts commonality between vehicles; and (5) provide the user the best high-technology truck possible. The Army also established fleet management goals that included reducing the average age of the fleet by replacing trucks within their economic useful life.

Originally conceived as a 15-year procurement for 120,156 trucks, the truck replacement program was stretched out in 1989, to 30 years, primarily because of funding constraints. In 1990, the program was reduced in size to 102,050 trucks because of anticipated force structure reductions. The total estimated acquisition cost of the truck replacement program is \$17.2 billion. In October 1991, the Army awarded a 5-year contract, the first of six such multiyear contracts planned, for the production of 10,843 trucks. The unit price of these trucks starts at about \$91,000. Initial low-rate production deliveries to the Army began on May 27, 1993. The Army's current schedule calls for full-rate production to begin in September 1994, with the first Army unit expected to be equipped with the new trucks during October 1994.

In June 1993, the Deputy Secretary of Defense testified before the House and Senate Committees on Armed Services that the Department of Defense (DOD) was taking steps to rethink its processes and practices for acquiring goods and services. One of these is the establishment of an

Office of the Deputy Under Secretary of Defense for Acquisition Reform. This new office will, among other things, identify opportunities to reduce acquisition costs, including moving away from broad reliance on buying defense-unique items when commercial items exist that will meet DOD's needs.

Results in Brief

The Army's strategy of extending the Family of Medium Tactical Vehicles acquisition schedule from 15 to 30 years will make it difficult to meet important program and fleet management goals and expectations, such as significantly reducing the average age of the fleet and lowering the fleet's operation and support costs. The acquisition strategy also raises operational concerns. For example, the Army does not expect the FMTV trucks to be purchased in sufficient quantities to eliminate the battlefield deficiencies of the medium tactical truck fleet until after 2012.

In developing its medium truck replacement program, the Army looked at several possible alternatives. The Army's analysis, however, considered a limited range of alternatives, was based on incorrect data, and assumed a 15-year procurement, not the current 30-year program. GAO identified several alternatives to the current program that could provide a more cost-effective medium tactical truck acquisition. One promising alternative is to purchase more of the Army's current 5-ton trucks, the M939A2, instead of the 5-ton replacement truck. The Army has purchased thousands of the M939A2 trucks since the development of the Family of Medium Tactical Vehicles program began, and the Army has been pleased with their performance and reliability.

Principal Findings

Stretch-Out of Acquisition Schedule Undermines Program Goals

The Army's 30-year acquisition strategy will impair the Army's ability to meet key fleet management and program goals and expectations. For example, the average age of the 5-ton fleet will increase by 45 percent over the next 20 years. Over one-fourth of the new medium truck fleet will be beyond its economic useful life (the average age where it is more cost-effective to replace a truck than repair it) of 20 to 22 years when the program is completed. The cost of replacing over 26,000 trucks has not been incorporated into the Army's program cost projections. Operations and support cost savings on the order of \$2 for every \$1 spent on

procurement will take almost 50 years to achieve. Finally, Army officials acknowledge that it is doubtful the program will continue its full 30 years without automotive advances making the new vehicles obsolete.

The current acquisition strategy also creates several operational concerns. First, despite the acquisition of the new medium tactical trucks, the fleet will not be considered militarily effective for another 20 years. Second, while the Army is adopting a new operational doctrine that stresses more deployable and mobile forces facing smaller regional threats, it will take about 60 more C-141 transport sorties (point-to-point transport missions) to deploy an airborne division equipped with the heavier, new 2.5-ton trucks than it would one equipped with the old trucks. Third, only one-tenth of the fleet will have new trailers, and the acquisition of those 10,272 trailers has been delayed, which will limit the payload and mobility of the new trucks.

Army's Original Assessment of Program Alternatives Was Limited

The Army's original assessment of program alternatives in 1987 was based in part on incorrect data and did not consider several alternatives, such as replacing trucks on a less than one-for-one basis or extending the service life of all the trucks in the current fleet. This assessment was a key factor in the Army's decision to move forward with the truck replacement program. The Army, in the assessment, used incorrect production cost data to develop cost comparisons between the new trucks and the alternatives and failed to correct that data in its 1991 update of the assessment. Further, the 1987 assessment underestimated the weight of the new 2.5-ton truck by about 45 percent. The expected lighter weight of the new trucks compared with the trucks in the current fleet was considered by the Army to be a major benefit, contributing to, among other things, improved off-road mobility, fuel efficiency, and air deployability. The new trucks are now expected to weigh about 4,400 pounds more than the current trucks.

Other Alternatives May Be More Cost-Effective

Several alternatives currently exist that could be more cost-effective than the new truck replacement program. These alternatives include (1) buying more of the M939A2 5-ton trucks, which are already in the Army's inventory, instead of buying the new 5-ton replacement truck; (2) reducing the size of the fleet by having each new truck replace more than one old truck rather than replace old trucks on a one-for-one basis; (3) modernizing only the "first-to-fight" contingency forces; (4) making greater use of an ongoing extended service program for older 2.5-ton or

5-ton trucks; (5) eliminating the 2.5-ton payload class of trucks; (6) shortening the new truck's acquisition schedule; and (7) assigning just one payload class of truck to selected divisions. While no alternative provides the Army with a perfect solution—especially since production of the new trucks has already begun—one or more of the alternatives could reduce overall program costs.

Of the seven alternatives, the purchase of more M939A2 trucks appears to readily meet DOD's objective to reduce acquisition costs and provide an opportunity to realize a more cost-effective program. The Army now has over 18,000 M939A2 trucks in its current inventory, along with a well-established logistics system, spare parts, and training and maintenance programs. According to the Army, the M939A2 performed extremely well during the Persian Gulf War and proved highly reliable.

In addition to these alternatives, expected force structure changes and reductions could significantly reduce the Army's medium truck fleet requirements, which would affect the size of the truck replacement program.

Recommendations

GAO recommends that the Secretary of the Army reassess the cost-effectiveness of the 30-year acquisition strategy for the Army's Family of Medium Tactical Vehicles program, especially in light of the negative impact of program length on program and fleet management goals and expectations. At a minimum, such a reassessment should consider (1) DOD's final force structure reductions (which have yet to be announced), (2) the impact of the Army's new operational doctrine on FMTV requirements, (3) the air deployability of the FMTV 2.5-ton truck, and (4) the need for more FMTV trailers. Further, GAO recommends that the Secretary of the Army not proceed to full-rate production of the Family of Medium Tactical Vehicles until the reassessment is complete.

To be consistent with DOD's recent acquisition reform objectives, which include reducing acquisition costs, GAO also recommends that the Secretary of the Army include the alternatives presented in this report, especially the M939A2 alternative, as part of the reassessment of the Family of Medium Tactical Vehicles program.

Agency Comments

As requested, GAO did not obtain fully coordinated DOD comments on this report. However, GAO discussed the results of its review with officials from

the Office of the Under Secretary of Defense for Acquisition; the Office of the Assistant Secretary of the Army for Research, Development, and Acquisition; and the Army Tank-Automotive Command. They generally disagreed with GAO's conclusions and recommendations. Their comments have been incorporated in the report where appropriate.

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Abbreviations

DOD	Department of Defense
FMTV	Family of Medium Tactical Vehicles
GAO	General Accounting Office

Introduction

The Army's fleet of approximately 124,000 medium tactical trucks is rapidly aging, costly to operate, and hard to maintain. It also lacks key operational capabilities. The Army plans to modernize the fleet through a replacement program known as the Family of Medium Tactical Vehicles (FMTV). The FMTV program is currently structured to procure more than 102,000 trucks by fiscal year 2021 at a cost of about \$17.2 billion.¹ In October 1991, the Army awarded a 5-year contract for the production of about 10,800 FMTV trucks. In addition, the Army has established a service life extension program to remanufacture some trucks in the current inventory.

Role and Composition of the Medium Tactical Truck Fleet

The Army considers its tactical trucks to be the backbone of its warfighting support and sustainment structure. To meet the Army's warfighting requirements, trucks must be deployable, mobile on any battlefield in all climate conditions, and require minimum maintenance. The medium tactical truck fleet is designed to perform a wide range of combat, combat support, and combat service support missions using two distinct payload classes, 2.5-ton and 5-ton.

The 2.5-ton cargo truck, a key vehicle in most Army company unit operations, is used for a variety of needs, including transportation of unit supplies, equipment, and personnel. The 5-ton cargo truck is the heavy duty performer of the medium fleet and is used to transport ammunition and support weapon systems in addition to general cargo transport. In addition to the cargo trucks, the Army has a number of special purpose medium trucks designed for specific needs. These include fuel and water tankers, dump trucks, and wreckers. Both the 2.5- and 5-ton trucks were originally designed in the late 1940s and have undergone improvements through the ensuing decades. Figure 1.1 shows an M44A2 2.5-ton cargo truck, and figure 1.2 shows an M939A2 5-ton cargo truck. These are the most recent versions of each payload class.

¹The 102,000 procurement objective is based on the Department of Defense's fiscal year 1995 base force structure. According to Army officials, the Army is planning to reduce the base force objective to a lower level. While the exact procurement objective is not currently known, the Army, as of July 1993, had established 72,500 medium trucks as a working estimate.

Figure 1.1: M44A2 2.5-Ton Cargo Truck



Figure 1.2: M939A2 5-Ton Cargo Truck



Condition of the Current Fleet

Most of the 2.5-ton trucks and many of the 5-ton trucks have exceeded their economic useful life and are costly to operate and maintain.² In particular, the Army considers the current 2.5-ton class of trucks as being unable to meet mission requirements while incurring high operation and support costs. Continued use of the older trucks will result in an escalation of these already high costs.

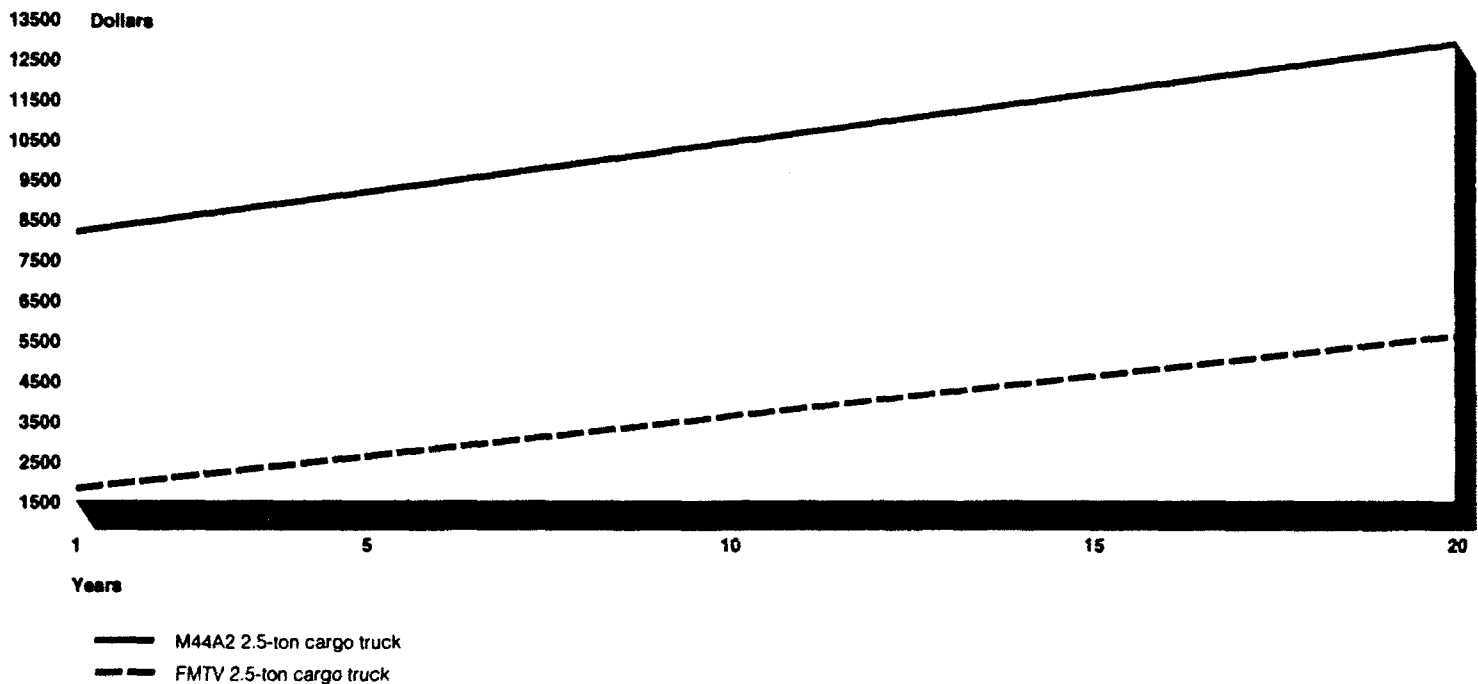
Aging 2.5-Ton Trucks Are Costly, Difficult to Maintain, and Do Not Meet Operational Requirements

The 2.5-ton fleet, made up primarily of the M44A2 series cargo truck, is, on average, well past its economic useful life of 20 years. Ninety-one percent of the trucks are more than 20 years old, and none are younger than 17 years old.

²The Army defines a vehicle's "economic useful life" as the average age where it is more cost-effective to replace a vehicle with the same type new vehicle than repair it.

The 2.5-ton truck is becoming increasingly more costly and difficult to maintain. The Army estimates that it is spending, on average, \$8,107 per year or \$4.62 per mile to maintain each truck. Increasing operation and support costs are a factor of age, and the Army predicts that these costs will continue to rise if the trucks are not retired. As shown in figure 1.3, a 24-year-old M44A2 2.5-ton truck's projected average annual operation and support costs would rise from \$8,000 in year 1 to \$13,000 in year 20, or a total cost of \$210,500 over 20 years. In comparison, the Army estimates that a new FMTV 2.5-ton truck would cost \$74,000 to operate and support over those same 20 years. Further, due to the age of the fleet, the Army has found it increasingly difficult to find manufacturers of replacement parts. Logistics and maintenance personnel from the 82nd Airborne Division, Fort Bragg, North Carolina, and the 24th Infantry Division (Mechanized), Fort Stewart, Georgia, told us they often had to use authorized cannibalization to obtain replacement parts.

Figure 1.3: Projected Operation and Support Costs for M44A2 and FMTV 2.5-Ton Cargo Trucks



Notes: Costs are in constant dollars.

Crew costs are not included because they are not directly related to the condition of the trucks.

For purpose of analysis, the M44A2 truck is assumed to be 24 years old and the FMTV truck 1 year old in year 1.

Source: Fleet Planning Office, Army Tank-Automotive Command.

The 2.5-ton fleet does not meet the Army's operational requirements, lacking the mobility, survivability, and reliability needed for the modern battlefield. According to the Army, the 2.5-ton truck does not have sufficient cross-country mobility to allow it to keep up with combat forces, and its large profile, slow speed, and poor acceleration limit its survivability. Officers and maintenance personnel from the 82nd Airborne Division, 1st Corps Support Command, and 24th Infantry Division (Mechanized) frequently cited problems with the reliability and performance of the 2.5-ton trucks as the result of their age and past use. One battalion maintenance officer from the 24th Infantry Division said that

his battalion's 2.5-ton trucks were so unreliable that the battalion generally used a mix of other available trucks to transport items.

5-Ton Fleet Includes Many Obsolete Vehicles

The Army's 5-ton fleet comprises three major series: the M939, the M809, and the M39. This fleet is, on average, younger and in overall better shape than the 2.5-ton fleet. The average age of the 5-ton fleet is about 14 years, with the youngest 5-ton version (M939A2) having an average age of about 2 years and the oldest version (M39) having an average age of about 26 years. From 1989 to 1993, the Army acquired 18,740 M939A2 5-ton trucks, which make up over one-fourth of the entire 5-ton fleet. The M809 series trucks have exceeded or are at the end of their 22-year economic useful life, and the M39 series trucks are overage and obsolete.

Fleet's Problems Demonstrated During Persian Gulf War

According to Army documents, Army Transportation Center officials, and personnel from the 82nd Airborne Division and 24th Infantry Division (Mechanized), the 2.5-ton and older 5-ton trucks performed poorly during the Persian Gulf War. As we reported in January 1992, commanders and maintenance personnel we spoke with generally believed that the Army's 2.5-ton and M809 series 5-ton trucks were unreliable and lacked adequate speed and mobility.³ On the other hand the M939A1 and M939A2 5-ton trucks received high marks for their performance. According to the Department of Defense's (DOD) April 1992 final report to the Congress on the Persian Gulf War, these trucks performed better than older models, and their readiness rates exceeded Army standards.

Army officials attributed the generally poor performance of the 2.5-ton and M809 series 5-ton trucks more to their age than to the harsh desert environment. Army documents noted that the older 5-ton trucks had poor mobility in sand while the newer M939A1s and M939A2s had excellent mobility due to improved tires and, in the case of the M939A2s, a central tire inflation system. The 2.5-ton truck, in particular, was cited for its poor performance and mobility during the war. For example, the 1st Infantry Division's after action report stated, "The 2 1/2 ton truck has outlived our capability to maintain it effectively. Every 2 1/2 ton truck should be replaced . . ." In addition, the Army's 1993 modernization plan for trucks described the 2.5-truck as the worst performing tactical wheeled vehicle in Operation Desert Storm.⁴

³Operation Desert Storm: Early Performance Assessment of Bradley and Abrams (GAO/NSIAD-92-94, Jan. 10, 1992).

⁴United States Army Modernization Plan, Volume II, Annex F, Tactical Wheeled Vehicles (Jan. 1993).

Army Program to Purchase New Trucks

The Army's FMTV program is based on a family concept that is designed to provide enhanced reliability and performance along with reduced logistics costs. The 2.5-ton and 5-ton trucks are expected to share a large number of common commercial components and parts.

Description of FMTV Trucks

The FMTV program is expected to provide the Army with a fleet of modern trucks with up-to-date automotive technology. The FMTV 2.5-ton truck is an all-wheel drive 4x4 truck that comes in van, cargo, and cargo with material handling equipment body styles. The FMTV 5-ton truck is an all-wheel drive 6x6 truck that comes in nine body styles: cargo, cargo with material handling equipment, long wheel base cargo, long wheel base cargo with material handling equipment, tractor, dump, wrecker, expansible van, and fuel tanker. The 2.5-ton cargo and the 5-ton cargo and dump trucks also come in air-droppable versions. The trucks have a turbocharged diesel engine, an automatic transmission with integral transfer case, all-wheel drive axles, a central tire inflation system, and off-road tubeless radial tires. See table 1.1 for a comparison of the FMTV 2.5-ton and 5-ton cargo trucks.

**Table 1.1: Features and Capabilities of
the FMTV 2.5-Ton and 5-Ton Cargo
Trucks**

Feature or capability	2.5-ton	5-ton
Air transport weight ^a (pounds)	18,138	21,555
Payload (pounds)	5,000	10,000
Trailer payload (pounds)	5,000	10,000
Cargo bed dimensions — length by width (inches)	144 X 95	168 X 95
Engine horsepower	225	290
Speed on a 2-percent grade (miles per hour)	55	55
Range (miles)	400	300
Material handling equipment lifting capability (pounds)	1,500	5,000
Mean miles between operational mission failure ^b	2,200	2,000
Mean miles between hardware mission failure ^c	3,000	2,700
Unit cost	\$91,348	\$109,082

^aAir transport weight includes the empty vehicle, all kits (such as the vehicle winch), and three-quarters of a tank of gas and excludes the machine gun ring mount and truck crew.

^bMeasures equipment failure due to software error, maintenance personnel error, crew error, accidents, improper manuals, hardware failure regardless of the cause, or support equipment failure.

^cMeasures hardware failure due to normal wear and tear or hardware flaw.

Expected improvements over the current 2.5-ton and 5-ton trucks include greater engine horsepower and speed, the ability to tow trailers equivalent to the truck's payload, material handling equipment integrated into some vehicles, a smoother ride, an ergonomically designed cab, and increased reliability. See appendix I for a detailed comparison of the M939A2 and the FMTV 5-ton trucks.

Key to the design of both payload classes is the commonality of commercial components and parts. Early in the program the Army decided that the 2.5-ton trucks would use many of the same components and parts of the heavier but more durable 5-ton trucks. According to the Army, the advantage of using common commercial items are greater availability of parts and less spares provisioning, proven technology, reduced costs and risks, lower operating and support costs, fewer components, and less training. The Army estimates that between 77.5 percent and 87.8 percent of the parts are common among the various FMTV versions. Commercial components include the engine and transmission. Figure 1.4 shows an FMTV 2.5-ton cargo truck, and figure 1.5 shows an FMTV 5-ton cargo truck.

Figure 1.4: FMTV 2.5-Ton Cargo Truck

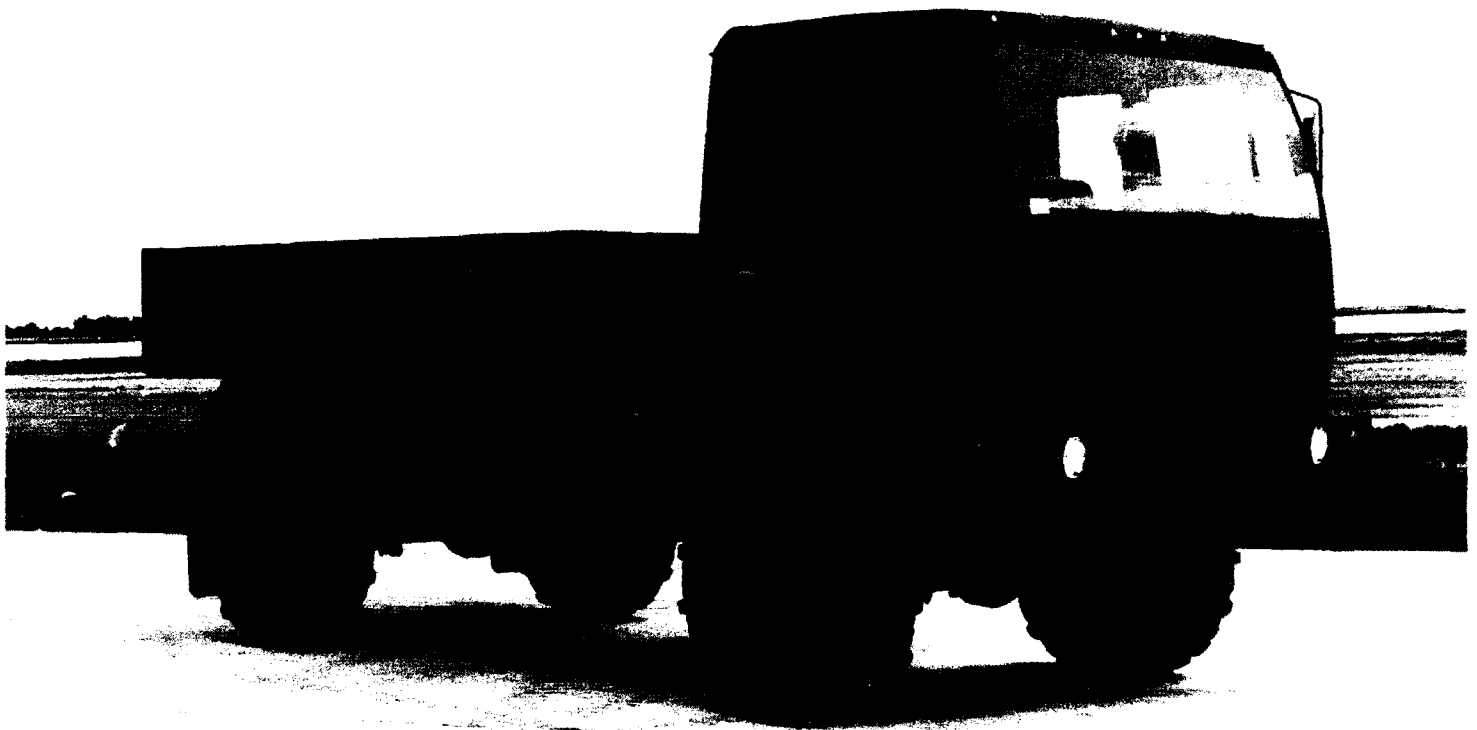
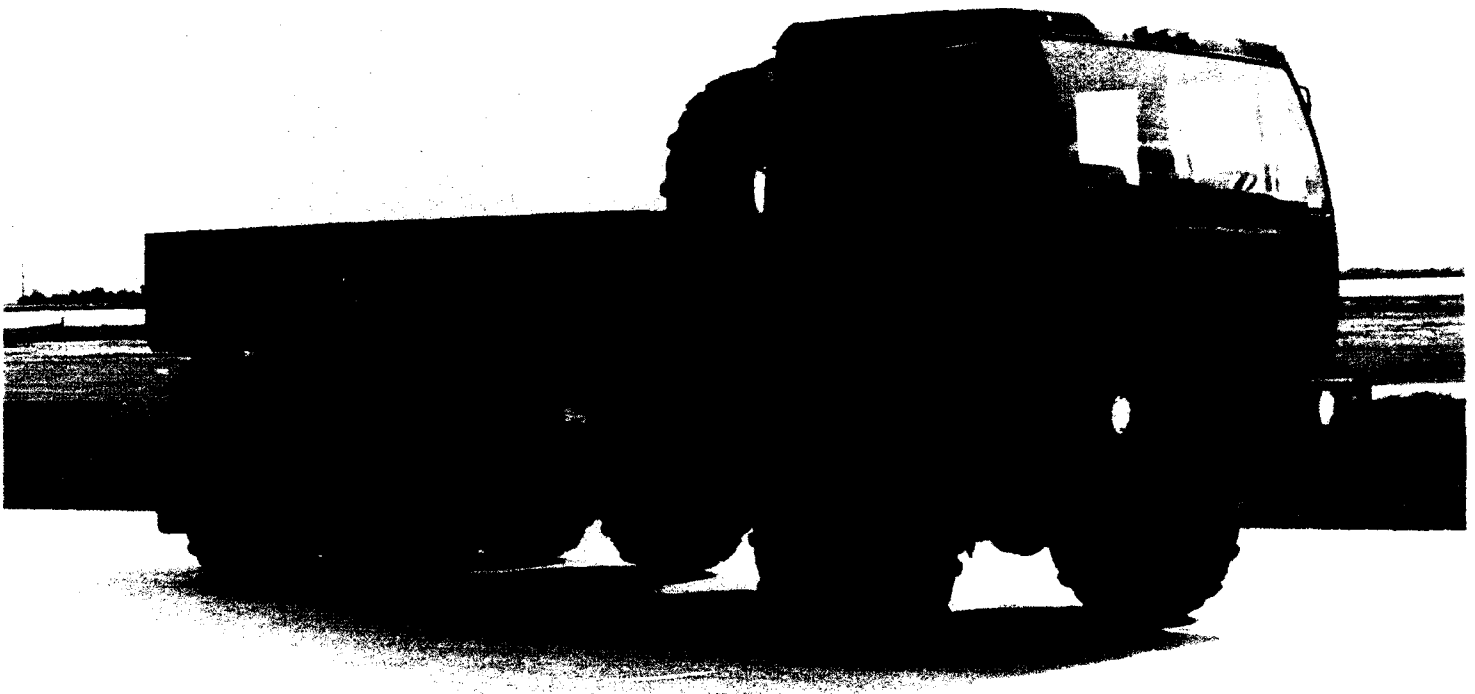


Figure 1.5: FMTV 5-Ton Cargo Truck



FMTV Program's History, Goals, Status, and Cost

Nine years after its initial conception, the Army's FMTV program entered initial low-rate production in April 1993. The Army plans to acquire 102,050 FMTV trucks (47,334 2.5-ton trucks and 54,716 5-ton trucks) over a 30-year period at a cost of about \$17.2 billion. The program is currently 1 year behind schedule.

Program History

In 1984 the Army began planning the development and acquisition of a medium tactical truck program that would replace its 2.5-ton and 5-ton trucks. The program entered the manufacturing development phase in 1987, and contracts for the development of prototypes were awarded to three contractors in 1988. Full-scale development testing and early user tests were completed in 1990. In September 1990, the Army Systems

Acquisition Review Council approved moving the program into low-rate production.

On October 11, 1991, the Army awarded the first 5-year contract to Stewart and Stevenson Services, Incorporated, of Houston, Texas, for the production of 10,843 FMTV trucks. Of these vehicles, 7,738 (about 70 percent) will be 2.5-ton trucks and 3,105 (about 30 percent) will be 5-ton trucks. The Army plans to acquire the FMTV trucks over a 30-year period through the use of such multiyear contracts. Stewart and Stevenson, as part of the initial contract, will provide the Army with a technical data package which will be used for competing follow-on contracts.

Program Goals and Expectations

The Army's goals and expectations for the FMTV program are to (1) reduce operation and support costs; (2) improve reliability, availability, and maintainability; (3) improve mobility and deployability; (4) have a high degree of parts commonality between vehicles; and (5) provide the user the best high-technology truck possible. The Army also established fleet and other management goals that included reducing the average age of the fleet by replacing trucks within their economic useful life and decreasing the total weight of the Army's truck fleets.

Program Status

Due to program restructuring and contractor delays, the FMTV program is currently about 1 year behind schedule. Initial fielding to units has been delayed from October 1993 to October 1994. Stewart and Stevenson began initial low-rate production at its Sealy, Texas, production plant in April 1993. The Army accepted delivery of the first production FMTV truck on May 27, 1993. The Army has, however, delayed the next major program decision—to begin full-rate FMTV production—from September 1993 to September 1994. Program officials told us that while the program is behind schedule, they expect the contractor to make up most of the slippage and complete the contract within 2 months of the original 5-year schedule. Table 1.2 shows changes in the FMTV program's milestones.

Table 1.2: FMTV Program Schedule Milestones (as of June 18, 1993)

Schedule milestone	Development estimate	1992 estimate	1993 estimate
Milestone I/II decision (approve (1) demonstration/validation phase and (2) engineering and manufacturing development phase)	8/87	5/87 ^a	5/87 ^a
Prototype contract awards	10/88 ^a	10/88 ^a	10/88 ^a
Full-scale development testing			
Start	12/89	1/90 ^a	1/90 ^a
Completion	10/90	12/90 ^a	12/90 ^a
Early user test and evaluation			
Start	5/90 ^a	5/90 ^a	5/90 ^a
Completion	10/90 ^a	10/90 ^a	10/90 ^a
Army Systems Acquisition Review Council Decision IIIA (approve low-rate production)	1/91	9/91 ^a	9/91 ^a
Production award	1/91	10/91 ^a	10/91 ^a
First production delivery	3/92	11/92	5/93 ^a
Production qualification test			
Start	3/92	11/92	6/93 ^a
Completion	10/92	8/93	2/94
Initial operational test and evaluation			
Start	^b	1/93	9/93
Completion	^b	6/93	3/94
Army Systems Acquisition Review Council Decision IIIB (approve full-rate production)	^b	9/93	9/94
First unit equipped and initial operational capability	12/92	10/93	10/94

^aActual dates achieved.

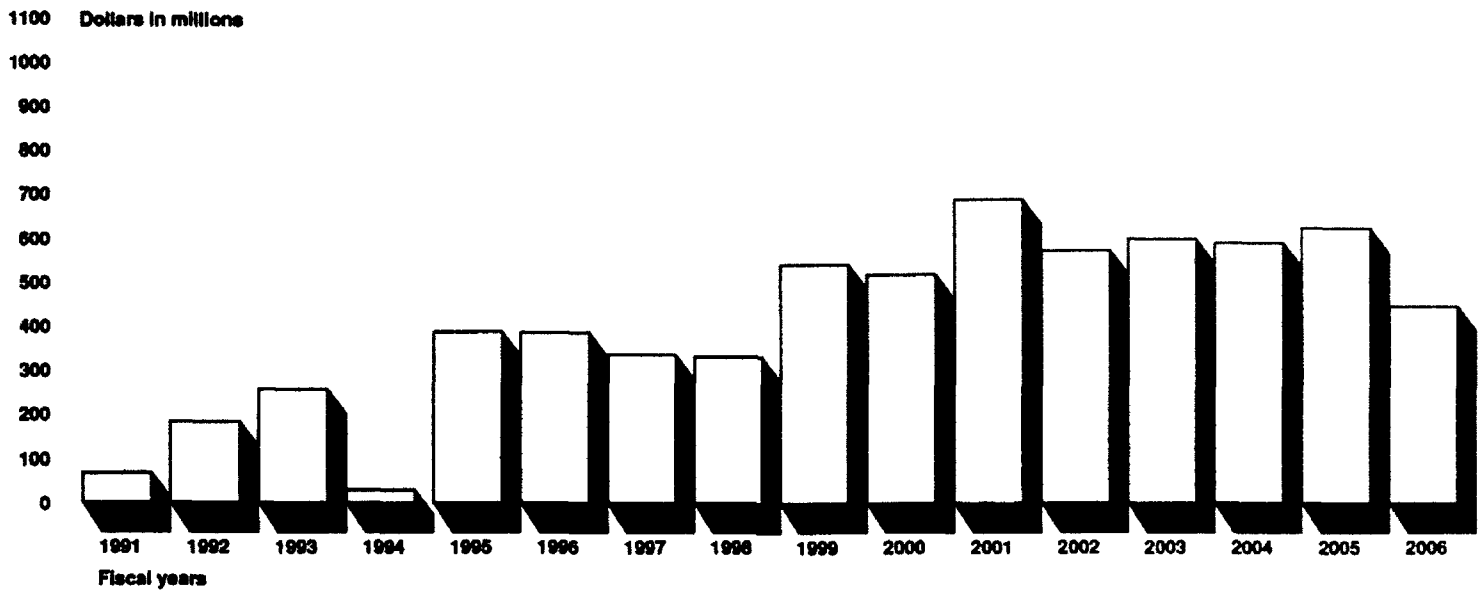
^bNo estimates were made for these events in the development estimate.

Source: Program Executive Office for Combat Support.

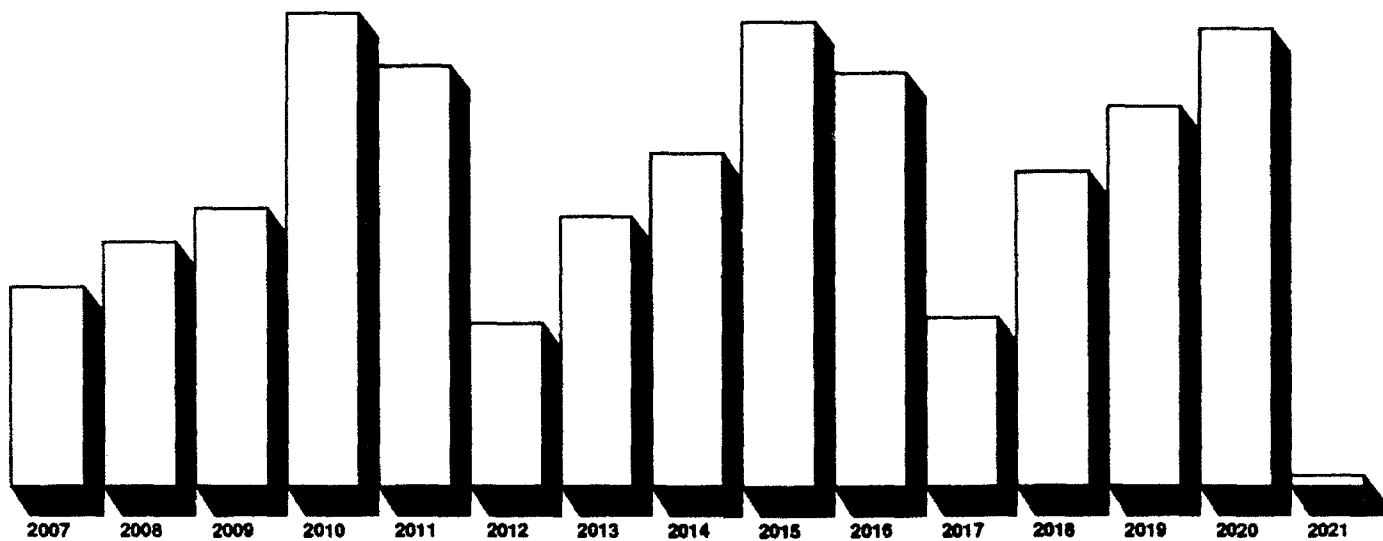
Program Cost

The total investment cost (research, development, and procurement) for the FMTV program is currently estimated to be \$17.2 billion (in inflation-adjusted dollars). This is down by \$3.2 billion from the Army's 1992 estimate of \$20.4 billion. The reduction is primarily the result of the use of a lower escalation rate. Under the new schedule production costs will peak at about \$1 billion in fiscal years 2010, 2011, 2015, 2016, and 2020. Figure 1.6 shows the estimated annual costs of the FMTV program.

Figure 1.6: FMTV Program's Estimated Annual Costs (Fiscal Years 1991-2021)



Source: FMTV Selected Acquisition Report, December 31, 1992.



Army Program to Extend Service Life of Existing Trucks

In 1990, congressional conferees called for the Army to establish a service life extension program to remanufacture a portion of the medium truck fleet, in particular the 2.5-ton trucks used by the reserve forces. Two program objectives, according to the conferees, should be to produce a remanufactured truck (1) at no more than half the cost of a new FMTV truck and (2) that has 80 percent of the service life of a new FMTV truck.

In response, the Army established the Extended Service Program to remanufacture M44A2 series 2.5-ton cargo trucks. The Army considers the program an interim effort to reduce operation and support costs and provide increased operational capabilities while the FMTV fleet is being fielded. The program involves remanufacturing vehicles using as many old components as possible; however, each truck will be equipped with a new engine, an automatic transmission, new tires, and a central tire inflation system. Program officials said they expect to be able to remanufacture two trucks for every three trucks submitted.

On May 8, 1992, the Army awarded contracts to two manufacturers for the development of prototype remanufactured vehicles. On October 8, 1992, the Army took delivery of eight prototype vehicles from each manufacturer. The Army conducted preproduction qualification testing

from October 1992 through June 1993. It plans to award a 5-year contract for the production of 2,608 remanufactured vehicles in August 1993.

In February 1993, the Army informed Congress that the objective of remanufacturing 2.5-ton trucks at no more than half the cost of purchasing an FMTV truck may not be attainable. While the actual unit cost will not be known until the Army selects a contractor, program officials expect that the unit cost will be about \$57,000, or 61 percent of the cost of an FMTV 2.5-ton truck. Program officials told us that, on the basis of preproduction qualification testing, they expect the remanufactured trucks to meet the 80-percent (16 years) service life objective.

Objectives, Scope, and Methodology

The Ranking Minority Member of the Senate Committee on Governmental Affairs requested that we review the Army's Family of Medium Tactical Vehicles program. Our objectives were to determine (1) the feasibility of meeting program and fleet management goals under the Army's 30-year acquisition strategy, (2) the extent to which the Army considered other medium truck alternatives in deciding to move forward with the FMTV program, and (3) whether more cost-effective alternatives exist now.

During our review we analyzed program and other documentation and interviewed officials at the Army's Program Executive Office for Combat Support, Warren, Michigan; Army Transportation School, Fort Eustis, Virginia; Training and Doctrine Command, Fort Monroe, Virginia; Tank-Automotive Command, Warren, Michigan; and the Office of the Deputy Chief of Staff for Operations and Plans, Washington, D.C. We also interviewed personnel at the 82nd Airborne Division, Fort Bragg, North Carolina; 1st Corps Support Command, Fort Bragg, North Carolina; and 24th Infantry Division (Mechanized), Fort Stewart, Georgia.

We also obtained information and interviewed officials from the following organizations:

- Army Materiel Command, Alexandria, Virginia;
- Military Traffic Management Command, Norfolk, Virginia;
- Combat Systems Test Activity, Aberdeen Proving Ground, Maryland;
- Ohio Army National Guard, Columbus, Ohio;
- 1484th Organizational Maintenance Shop, Ohio Army National Guard, McConnellsville, Ohio;
- Army National Guard, Arlington, Virginia;
- Stewart and Stevenson Services, Incorporated, Sealy, Texas;

- Automotive Operations, Rockwell International, Newark, Ohio; and
- BMY (Wheeled Vehicle Division), Harsco Corporation, Marysville, Ohio.

We conducted our review from August 1992 to July 1993 in accordance with generally accepted government auditing standards. As requested, we did not obtain fully coordinated DOD comments on this report. However, we discussed the results of our review with officials from the Office of the Under Secretary of Defense for Acquisition; the Office of the Assistant Secretary of the Army for Research, Development, and Acquisition; and the Tank-Automotive Command. They generally disagreed with our conclusions and recommendations. Their comments have been incorporated in the report where appropriate.

Program Stretch-Out and Other Factors Impair the Army's Ability to Meet Goals

The Army's shift from a 15-year to a 30-year acquisition schedule will make it difficult to meet several basic program and fleet management goals and expectations, including (1) replacing trucks within their economic useful life to reverse the aging of the fleet and (2) achieving significant operation and support cost savings. The longer acquisition schedule raises the possibility that the Army could need an improved or entirely new vehicle before the program is completed. The acquisition strategy also raises operational concerns. For example, the medium truck fleet is not expected to be militarily effective until well into the next century, and the acquisition of new FMTV trailers will be significantly delayed. Moreover, the 2.5-ton truck will be less air deployable than anticipated, and only one-tenth of the fleet will have new trailers. Finally, the stretched-out acquisition will exceed the economic useful life of the trucks bought during the first 10 years of the program, but the cost to replace these trucks is not included in the estimated total program cost.

Funding Constraints Forced Restructuring of Program

The Army previously planned for a 15-year acquisition schedule. For instance, the Army had (1) justified the FMTV program in 1987 based on a 15-year acquisition schedule¹ and (2) reported a 15-year acquisition schedule in its December 1988 Selected Acquisition Report. In its 1989 modernization plan, however, the Army stated that funding constraints could result in trade-offs for each of its truck programs, including changes in procurement scheduling. The plan stated:

Army resource constraints heighten the need for clear articulation of [truck] requirements, procurement scheduling, acquisition strategies, resource requirements and fleet priorities. To satisfy these needs and to address Congressional concerns, a long range plan (30 years) has been prepared. It differs from previous studies and analyses by imposing fiscal constraints and documenting the trade-offs and decisions required to reduce procurement and sustainment costs.²

The modernization plan identified two acquisition schedules for each of its truck modernization programs, including the FMTV program. One schedule was economically constrained, and the other was an optimum unit requirement.

The Army reported that it had extended the FMTV acquisition schedule, from 15 to 30 years, in its December 1989 Selected Acquisition Report and

¹Tactical Wheel Vehicle Cost and Operational Effectiveness Analysis, Army Training and Doctrine Command (Jun. 4, 1987).

²Army Tactical Wheeled Vehicle Modernization Plan, U.S. Army (Apr. 13, 1989).

explained to Congress why the shift involved an increase in program acquisition unit cost, from about \$72,000 to \$134,000, in a special report in March 1990.³ The Army noted that the unit cost increase resulted primarily from the change in the procurement schedule (from 15 to 30 years) and the impact of inflation.

An Army Training and Doctrine Command report noted that the 1989 plan created serious concerns within the Army about the affordability of its truck acquisition programs. It noted that an unconstrained procurement, based on the Army's requirements, would require an initial \$8.1 billion investment and about \$1.5 billion annually to maintain the light, medium, and heavy truck fleets. This was viewed as unrealistic, especially when considering that trucks have historically received a lower priority when compared to Army weapon systems.

Affordability concerns reduced the numbers of trucks to be bought in the first multiyear contract from about 18,500 to 10,843. According to Army officials, affordability concerns also delayed acquisition of over 10,000 FMTV trailers to the second multiyear contract.

Not Replacing Trucks Within Their Economic Useful Life Means That the Medium Fleet Will Continue to Age

An original fleet management goal was to replace most of the medium fleet trucks within 15 years, well within their economic useful life. This would have reversed what the Army considers to be unacceptable aging of the fleet. The stretch-out to a 30-year program means that the Army cannot meet this goal and will continue to have an aging medium fleet at the end of the program. For example, according to the Army, the average age of the 5-ton fleet will increase by 45 percent by 2013, from 12.8 years in 1992 to 18.6 years in 2013. Overall, there will be essentially little change in the average age of the entire medium fleet through 2007. While some improvement is expected after that, it will be only temporary since the initial FMTV trucks begin to reach the end of their economic useful life in 2013.

Army Will Not Achieve Two-for-One Cost Savings For Almost 50 Years

Under the current acquisition schedule, the Army does not expect to achieve operation and support cost savings on the order of \$2 for every \$1 spent on research, development, and procurement for nearly 50 years. This is well beyond the economic useful life of the initial vehicles and this does not include the cost of any replacement vehicles. While it will take almost

³The program acquisition unit cost represents a composite average cost for all of the different truck and trailer variants planned for production.

50 years to achieve these savings on a fleetwide basis, the Army believes that it will achieve significant savings for each new truck as it is fielded. For example, replacing a 24-year-old M44A2 series 2.5-ton truck with a new FMTV 2.5-ton truck would result in annual operation and support cost savings of about \$6,400, according to Army estimates.

An Improved or New Vehicle Will Likely Be Needed Before the Program Is Completed

Army officials told us that it is unlikely the FMTV program will be completed without a new or improved vehicle or engine being acquired by the Army. This speculation is based on expected technological advances in automotive engineering and stricter environmental standards for engines. Technological advances will, at the very least, make an upgraded FMTV truck an attractive option. Army officials told us that because of automotive advances, new vehicles become obsolete between 10 and 15 years in service. Stricter environmental standards may also necessitate more efficient engines or exhaust systems. The introduction of a new vehicle would reduce the benefits the Army hoped to gain from having commonality of components and parts in the entire medium truck fleet.

30-Year Program Affects Military Effectiveness of Medium Fleet

The stretch-out of the acquisition schedule affects the Army's efforts to improve the military effectiveness of the medium fleet. For example, the Army codes the military effectiveness of the medium fleet as being "red," or not capable, well into the next century because FMTV trucks are not expected to be procured in sufficient quantities to eliminate battlefield deficiencies before then.

FMTV 2.5-Ton Truck Is Less Air Deployable Than Its Predecessor

The Army's new operations doctrine envisions contingency forces based in the United States that will respond quickly to crises worldwide by airlift and sealift. While the need for a more strategically deployable vehicle was, in part, the impetus for the FMTV program, the FMTV 2.5-ton truck will be less air deployable than its predecessor.

An Army goal was to deploy two FMTV 2.5-ton cargo trucks on a C-130 and two FMTV 5-ton cargo trucks on a C-141. Further, the Army justified the FMTV, in part, on an 11-percent reduction in the number of C-141 sorties (point-to-point transport missions) required to move a heavy division. As late as January 1993, the Army's modernization plan for trucks depicted two FMTV 2.5-ton trucks being deployed on a C-130 and four on a C-141.

The air transport weight of the FMTV 2.5-ton truck will be 4,419 pounds more than the current 2.5-ton truck. As a result, it will be less air deployable, requiring a higher number of air sorties than the current vehicle. A March 1993 Army analysis, conducted at our request, shows that only one FMTV 2.5-ton can be carried on a C-130 and two on a C-141. It will take 933 C-141 sorties to deploy an FMTV-equipped airborne division overseas, about 60 more C-141 sorties than it would one equipped with the current vehicles.

Low Quantities and Delayed Acquisition of Trailers Will Limit Payloads and Mobility

Although the Army recommended in its 1987 assessment of the FMTV program that 39,774 trailers be purchased, it now plans to purchase only 10,272 FMTV trailers, or about 10 percent of the number of trucks to be purchased. The lower acquisition quantity means that fewer trucks will be equipped with the new trailers, limiting their payloads and mobility. In order to save money in the early part of the program, the Army has also delayed testing and purchase of the first 1,000 new trailers until sometime during the second multiyear contract. With or without the new trailers, the majority of FMTV trucks will be required to pull older, less capable trailers well into the next century. In addition, an Army official stated that the Army is currently experiencing a shortage of its older trailers.

The Army's 1987 assessment of the FMTV program based its recommendation to proceed with the program, in part, on an expected increase in trailer capacity and average unit mobility. Each trailer is expected to carry a load equivalent to that carried in the truck, and the average unit mobility is expected to increase by 15 percent when the trailers are used. In 1992 testimony before the Subcommittee on Defense, House Committee on Appropriations, the Army emphasized that trailers were urgently needed and were important because of their key role in transporting equipment and supplies to combat forces.

Costs of Replacing Initial Vehicles Excluded From Projections

Because the 30-year FMTV program will exceed the economic useful life of almost all of the trucks bought during the first two 5-year contracts, the Army will need either to replace those vehicles or to pay continually escalating operation and support costs. The Army has not factored these costs into the FMTV program's \$17.2 billion cost projection. As a general rule the Army believes that keeping trucks beyond their economic useful life leads to unacceptable operation and support costs and a decrease in wartime operational effectiveness.

With an expected economic useful life of 20 years for the FMTV 2.5-ton trucks and 22 years for the FMTV 5-ton trucks, those vehicles procured during roughly the first third of the program will have exceeded their useful life before the Army completes its procurement objective. Our analysis shows that between 2013 and 2023, approximately 26,600 trucks, or 26 percent of the total FMTV fleet, will be past their useful life and in need of replacement.

Army Modernization Plan Expects Truck Funding to Be Inadequate

The Army's 1993 modernization plan for trucks states that projected funding resources will not be adequate to satisfy requirements. The plan projects a reduced average level of procurement funding between 1993 and 2012 for its light, medium, and heavy fleets from the level projected in its 1989 plan. During this period, projected procurement funding for all three fleets averages \$667 million (in 1993 constant dollars) versus \$769 million in the 1989 plan. The 1993 plan presumes, however, a major increase in procurement funding in the year 2003—from \$428 million the previous year to \$824 million, a 93-percent increase in funding for tactical wheeled vehicles. After this increase the funding stream is projected to remain essentially at this level through 2012.

The modernization plan states that "the U.S. Army is fielding the best vehicles in the world, but increased investment is needed to field them in sufficient quantities, and in time, to achieve and maintain a world class fleet." The Army also expects this funding shortfall could increase its projected tactical wheeled vehicle operation and support costs by as much as 40 percent.

Conclusions

The 30-year acquisition strategy for the FMTV program raises major questions concerning the Army's goals for the medium truck fleet, particularly those related to lowering the average age of the fleet and reducing the fleet's operation and support costs. The fleet will continue to age, particularly after 2013. In addition, while every new truck helps reduce operation and support costs, it will take almost 50 years under the present plan to realize two-for-one operation and support cost savings fleetwide.

The program's 30-year schedule also means that at the completion of the FMTV program the Army will need to modernize a truck fleet that suffers many of the same problems afflicting the current medium fleet: an aging

truck fleet, rapidly rising operation and support costs, and vehicles using a 40-year-old basic design.

With the FMTV program experiencing production and other delays, the Army has an excellent opportunity to reassess its medium truck replacement program. The condition and age of the Army's current fleet are such, however, that this issue deserves immediate attention. Further, since the FMTV program began, DOD's national military strategy has changed focus, and the Army's basic operational doctrine has evolved into one that relies on a highly deployable, U.S.-based force designed to meet various regional threats.

Recommendations

We recommend that the Secretary of the Army reassess the cost-effectiveness of the 30-year acquisition strategy for the Army's FMTV program, especially in light of the negative impact of the program's length on program and fleet management goals and expectations. At a minimum, such a reassessment should consider (1) DOD's final force structure reductions (which have yet to be announced), (2) the impact of the Army's new operational doctrine on FMTV requirements, (3) the air deployability of the FMTV 2.5-ton truck, and (4) the need for more FMTV trailers. Further, we recommend that the Secretary of the Army not proceed to full-rate production of the FMTV until the reassessment is complete.

Alternatives to Current FMTV Program May Be More Cost-Effective

The Army's original review of alternatives to the FMTV was limited and based in part on incorrect data. Several cost-effective alternatives to the present FMTV program may now exist. These alternatives include substituting the M939A2 5-ton truck for the FMTV 5-ton truck, replacing the current fleet on a less than one-for-one ratio, or modernizing only the "first-to-fight" contingency forces. While no alternative provides the Army with a perfect solution—especially since FMTV production has already begun—one or more of the alternatives could reduce overall program costs.

Original Assessment of Alternatives Was Based on Incorrect Data and Limited in Scope

The Army's 1987 assessment that recommended the FMTV program over other alternatives was based in part on incorrect data. Our review of the Army's analysis revealed problems both in the overall program cost and weight data used to assess the FMTV 2.5-ton cargo truck. The Army acknowledged that this data was not reflective of the eventual program. The Army's 1987 analysis also was limited in the scope of alternatives reviewed.

Data Problems Found in Army Studies

Between 1987 and 1991, the Army's estimate of total program costs rose by \$9.2 billion, or 86 percent, from \$10.6 billion to \$19.8 billion (in inflation-adjusted dollars).¹ This increase was the result of using incorrect production cost data in the 1987 estimate and the increase in program length from 15 to 30 years. Despite the significant increase in program cost and length, the Army failed to reevaluate its cost analysis in its 1991 update of the 1987 assessment.² Based on the 1987 analysis, the life cycle cost advantage of procuring the FMTV was, at best, only \$3.1 billion over an alternative involving building more of the existing trucks.

During the same period, the air transport weight of the FMTV 2.5-ton cargo truck rose about 32 percent, from 13,720 to 18,138 pounds. The Army's analysis, however, was based on an FMTV 2.5-ton truck that weighed 10 percent less than the vehicle it was to replace. Vehicle weight is important because it can affect reliability, availability, maintainability, durability, mobility, and deployability. In its 1987 assessment, the Army highlighted the benefits of the FMTV 2.5-ton truck's lighter weight, stating that this would contribute to improved off-road mobility, fuel efficiency,

¹Because of a decreased escalation rate and other factors, the total estimated program cost has since been reduced to \$17.2 billion.

²Family of Medium Tactical Vehicles Cost and Operational Effectiveness Analysis Update, Army Training and Doctrine Command (Jan. 31, 1991).

and air deployability. However, the FMTV 2.5-ton truck is 4,419 pounds heavier than the current 2.5-ton truck.

An Army official said that the Army decided in 1988 to use many of the same components and subsystems, as well as the same chassis, for the FMTV 2.5-ton truck as it planned to use on the FMTV 5-ton truck. Because common components and parts must meet the durability requirements of the 5-ton truck, they are generally heavier than would be components and parts designed specifically for the 2.5-ton truck. The official could not provide any documentation to show that the Army assessed the impact of this decision on program costs or goals. He told us, however, that while the increase in weight would have some negative impact, it would help improve vehicle durability, reliability, availability, and maintainability because a heavier truck is a sturdier and more durable vehicle.

Alternatives Reviewed Were Limited

In the 1987 assessment, the Army limited its review to two sets of alternatives—four involving new trucks and four involving a combination of new trucks and remanufactured trucks. Each set included a fleet of new current trucks, new FMTV trucks, current 5-ton trucks only, and FMTV 5-ton trucks only. All of these alternatives were based on replacing trucks on a one-for-one basis.

Our review indicated that the Army's analysis (1) did not consider replacing vehicles on a less than one-for-one basis, (2) did not include combinations of alternatives (except in the case of remanufactured trucks), and (3) did not include a totally remanufactured truck fleet. In addition, since the M939A2 had yet to be produced, the Army did not include it in this analysis.

Alternatives to Current Acquisition Program

During our review, we identified several alternatives to the current FMTV program that may be more cost-effective. These involve the current medium fleet vehicles, the new FMTV trucks, or a combination of both. Each alternative has advantages and disadvantages that warrant careful consideration by the Army.

Buy More M939A2 Trucks

One alternative to the current program that may be more cost-effective is to purchase more M939A2 5-ton trucks instead of the FMTV 5-ton trucks. Although the Army did not include the M939A2 in its 1987 analysis, it has purchased more than 18,000 of them since FMTV development began.

Moreover, the M939A2's performance during Operation Desert Storm received high praise from combat commanders for its tactical performance.

Testing and actual performance data show that the M939A2 is a reliable, high-performance truck. For example, during a 1990 test at Fort Stewart, Georgia, the M939A2 was described as "extremely reliable with only one mission failure during the entire test." The truck achieved 17,588 mean miles between operational mission failures. While the test data was not gathered for the purpose of determining the reliability of the M939A2, it does indicate that the truck has performed better than expected. The Army's official reliability figure for the M939A2 is 1,070 mean miles between operational mission failure; however, this figure is extrapolated from data gathered for a different measure of reliability during tests conducted in the late 1980s.

The Army's procurement of more M939A2 trucks instead of FMTV trucks would also be consistent with DOD's recent acquisition reform objectives, which include efforts to reduce acquisition costs. The Deputy Secretary of Defense testified several times before congressional committees in June 1993 that, among other things, DOD must find ways to reduce acquisition costs. We believe that using an experienced contractor, which has produced the M939A2 for the active Army, Army Reserve, Army National Guard, and foreign military sales, may provide the Army with an immediate opportunity to reduce the FMTV program cost.

Army officials told us that the last time they priced the M939A2, it cost about \$94,000—about \$15,000 less than an FMTV 5-ton truck. Other potential savings that may be realized by buying more M939A2 trucks result from the existing support systems in place for the more than 18,000 M939A2 trucks already in the Army's inventory. The M939A2 is a mature system with a logistics system and training program established and maintenance personnel experienced in repairing the truck. No such support system now exists for the FMTV.

Replace the Fleet on a Less Than One-for-One Ratio

Another possible cost-effective alternative could be to replace all or part of the fleet on a less than one-for-one basis. Generally, Army truck replacement studies have been limited to a one-for-one vehicle replacement ratio, stating that the Army has done everything possible already to reduce its unit requirements. While replacing the truck fleet on

a less than a one-for-one basis would require the Army to reevaluate its total truck requirements, the benefits may be great.

**Modernize Only the
Contingency Forces**

A third possible cost-effective alternative is to use the FMTV trucks only for the portion of the fleet that will rapidly deploy with the first-to-fight contingency forces. The rest of the fleet could rely on M939A2 trucks and 2.5-ton trucks that have been remanufactured through the Extended Service Program. According to Army officials, a variation of this alternative is under consideration.

**Make Greater Use of the
Extended Service Program**

The Army could make greater use of the Extended Service Program than now planned in order to offset new procurement costs. This would involve remanufacturing either 2.5-ton or 5-ton trucks or a combination of both for the reserve forces or for lower priority stateside active duty units. Final decisions on this alternative should be based on the results of the Army's extended service testing of the current 2.5-ton truck, which was completed in June 1993.

**Eliminate the 2.5-Ton
Payload Class**

Eliminating the 2.5-ton payload class would allow the Army to standardize its medium fleet using only one basic vehicle—the 5-ton truck. According to Army officials, the Army has produced four studies since 1980 rejecting this alternative.

On the basis of its most recent study, in 1989, the Army concluded that the 2.5-ton payload class should be retained in the Army force structure.³ This study, however, falls short of presenting a convincing case for retaining this payload class. In fact, the study notes in its conclusions that it is feasible to replace the 2.5-ton trucks by using 1.25-ton and 5-ton trucks and associated trailers.

There are several other problems with the study. First, it did not address the operational improvements of having added truck payload and capability or improved mobility that the alternatives provided, especially that of the all 5-ton alternative. Second, while all the alternatives were shown to be more costly than the FMTV 2.5-ton and 5-ton fleet, the differences were insignificant, according to the study, because of possible errors in the cost estimates. Third, the study assumed improvements in air

³A Study of the Feasibility of Eliminating the 2 1/2 Ton Payload Class, Final Report, Science Applications International Corporation (Apr. 28, 1989).

deployability for the 2.5-ton truck, an assumption that our review indicated was no longer valid.

In support of their conclusion that the 2.5-ton payload class should be retained, the authors noted that there was an "intangible cost to the Army [in eliminating the 2.5-ton payload class] that should be considered. The implementation of such a course of action would change the familiar way the Army has operated for decades and would force redefinition of load plans and operating procedures for nearly every unit in the Army, with attendant near term impacts on readiness and training."

Shorten FMTV's Acquisition Schedule

The Army could also give trucks an increased priority (relative to other competing procurement programs) and thus increase funding for medium tactical trucks in order to shorten the 30-year acquisition schedule to one that will replace vehicles within their economic life. Further, Army officials told us that expected force structure changes and reductions are likely to significantly reduce the number of required FMTV vehicles. Reductions could range from 20,000 to 30,000 medium trucks. A reduction of this magnitude could allow the Army to shorten the program length and lower the total program cost.

Assign Only 5-Ton Trucks to Selected Divisions

Replacing the 2.5- and 5-ton trucks in selected divisions with only 5-ton trucks could improve operational capabilities and reduce current operation and support costs. This would limit the division's medium fleet logistics and maintenance requirements to only one type of vehicle. Certain divisions would prefer such "pure fleetings." For example, during our visit to the 24th Infantry Division (Mechanized) we were told that the commanding general requested that the division be allowed to procure a pure 5-ton fleet.

Conclusions

The Army's 1987 analysis of the FMTV program did not assess all reasonable alternatives, nor did the 1991 update include alternatives such as the M939A2 that emerged after the original analysis. In addition, despite changes to the basic assumptions used in the 1987 analysis, the Army chose not to update its cost comparison of the alternatives originally reviewed.

While we considered a number of alternatives, the seven, or a combination of the seven, presented in this report may provide opportunities for the

Army to improve the cost-effectiveness of its FMTV program. Because of the existing logistics system and training and maintenance programs already in place, we believe that buying more M939A2 trucks instead of FMTV 5-ton trucks may present the Army with the best opportunity to realize a reduction in program costs.

Recommendation

To be consistent with DOD's recent acquisition reform objectives, which include reducing acquisition costs, we recommend that the Secretary of the Army include the alternatives presented in this report, especially the M939A2 alternative, in the Army's reassessment of the FMTV program.

Comparison of the Army's M939A2 and FMTV 5-Ton Trucks

The M939A2, the most modern vehicle in the Army's existing medium truck fleet, has many of the capabilities and characteristics of its successor, the FMTV 5-ton truck. The Army considers the M939A2 to be a very reliable vehicle and a match for comparable trucks fielded by other nations. The M939A2 and FMTV 5-ton have essentially similar mobility and transportability capabilities, while the FMTV 5-ton possesses measurable improvements in performance and features. In addition, the Army claims that the FMTV 5-ton attains significant improvements in reliability; however, the available data is ambiguous.

Background

The M939A2

The most recently procured 5-ton vehicle in the existing medium fleet is the M939A2, manufactured by BMY in Marysville, Ohio. Approximately 23,700 of these vehicles were produced by 1993, on a 5-year production contract awarded in May 1986, and 18,740 are currently in the Army's inventory. Each truck has an estimated economic useful life of 22 years. The M939A2 is the second modernization of the basic M939 vehicle and is based on a vehicle originally designed in 1949. Over 16,000 M939 and M939A1 vehicles are currently in the Army's inventory. In terms of age, the Army considers the M939 series of vehicles (the M939, M939A1, and M939A2) to be modern.

The M939 was initially procured in 1981 to improve the capabilities of the medium fleet by adding an automatic transmission, improved power steering system, complete airbrake system, improved cooling system, improved electrical system, three-crew cab, tilt-hood, and a hydraulically powered front winch. The M939A1, a modification of the original M939, added super-single radial tires. This version was acquired beginning in 1985.

The M939A2 trucks have a central tire inflation system, a new diesel engine, and chemical agent resistant coating. BMY produced six body styles of the M939A2 for the Army. These body styles are cargo, long wheelbase cargo, dump, tractor, expansible van, and wrecker.

The FMTV 5-Ton

The FMTV 5-ton is intended to be the successor for the M939A2. Under current plans, the FMTV 5-ton will replace all the various types of 5-ton

vehicles now in the inventory with nine variants. The body styles are cargo, cargo with material handling equipment, long wheel base cargo, long wheel base cargo with material handling equipment, tractor, dump, wrecker, expansible van, and fuel tanker. Air-droppable versions of the FMTV 5-ton dump and cargo trucks will also be manufactured. The FMTV 5-ton is based on the Steyr 12 M 18 truck ordered by the Austrian Ministry of Defense in 1985.

Capabilities Comparison

The M939A2 and the FMTV 5-ton possess many similar capabilities and characteristics. FMTV improvements over the M939A2 include greater engine horsepower and speed, the ability to tow FMTV trailers, material handling equipment integrated into the vehicles, smoother ride, larger pool of potential operators, increased reliability, and decreased preparation time for loading and unloading on transport aircraft.

Table I.1 presents a comparison broken out into five areas: performance, mobility, features, reliability, and transportability. This analysis is limited by two factors: (1) the FMTV 5-ton data is based on test results achieved by prototype vehicles or contract requirements, not actual testing on production vehicles, and (2) there has been no side-by-side comparison of the production FMTV 5-ton with the M939A2, which an Army official told us was the most valid method to obtain comparative information in several areas, especially reliability. Side-by-side testing will occur during initial operational test and evaluation, scheduled for completion in March 1994.

Appendix I
Comparison of the Army's M939A2 and
FMTV 5-Ton Trucks

Table I.1: 5-Ton Tactical Truck Comparison

Capability	M939A2	FMTV 5-ton
Performance		
Range (miles)	300	300
Estimated economic useful life (years)	22	22
Engine horsepower	240	290
Speed on a 2-degree slope (miles per hour) ^a	45	55
Mobility		
Radial tires	Yes	Yes
Automatic transmission	Yes	Yes
Central tire inflation system ^b	Yes	Yes
Tows 1.5-ton trailers	Yes	Yes
Tows FMTV 5-ton trailers	No	Yes
Features		
Cab capacity (occupants)	3	3
Absorbed power (WATTS) ^c	12	6
Chemical agent resistant coating	Yes	Yes
Forward self-recovery	Yes	Yes
Aft self-recovery	No	Yes
HAEMP ^d protection	No	Yes
Material handling equipment	No	Yes
Three-point safety harness ^e	No	Yes
5th to 95th percentile soldiers ^f	No	Yes
Reliability^g		
Mean miles between operational mission failure ^h	1,070	2,000
Mean miles between hardware mission failure ⁱ	1,425	2,700
Transportability		
C-130 aircraft (number of trucks)	1	1
C-141 aircraft (number of trucks)	2	2
C-5 aircraft (number of trucks)	6	6
Container ship transportable	Yes ^j	Yes
Helicopter transportable	No	Yes
Airlift onload preparation time (minutes)	30	10
Airlift offload preparation time (minutes)	45	1

(Table notes on next page)

Appendix I
Comparison of the Army's M939A2 and
FMTV 5-Ton Trucks

^aIncreases in speed allow a vehicle to more easily fulfill its support mission for fast-moving combat units, as well as make more support trips to stationary units within a limited time.

^bEnhances off-road mobility through the ability to raise and lower the tire pressure while the vehicle is in motion and thereby obtain better traction in conditions ranging from mud to sand to snow.

^cMeasures the amount of energy encountered by the contents of the vehicle's cab during motion. Reductions in WATTS translate into reduced driver fatigue.

^dHigh Altitude Electromagnetic Pulse Protection, which ensures operation of mission-essential equipment after a nuclear high altitude blast.

^eLap and shoulder seat belts.

^fSoldiers in this interval are determined by a combination of factors, among which are height and weight. The Army requires that soldiers in this interval be physically capable of maintaining and operating the FMTV trucks.

^gThe data comparing the reliability of both vehicles is ambiguous. The figures for the M939A2 are extrapolated from data gathered in the late 1980s for a different measure of reliability and under different testing conditions than the FMTV trucks. It should be noted that the M939A2 achieved 17,588 mean miles between operational mission failure at a test in 1990.

^hMeasures equipment failure due to software error, maintenance personnel error, crew error, accidents, improper manuals, hardware failure regardless of the cause, or support equipment failure.

ⁱMeasures hardware failure due to normal wear and tear or hardware flaw.

^jAlthough the M939A2 is 1.4 inches wider than the Army requirement for containership loading, it is easily loaded on containerships. For example, the 9th Infantry Division experienced no loading difficulties for containership deployment in an overseas exercise in January 1993.

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